Research Needed: Business Opportunities in the Farmer-led Regenerative Agriculture Movement in New Zealand

Corresponding Author:
E Burns
edgar.burns@waikato.ac.nz
c/o mailroom, EIT Hetley Bldg, 501 Gloucester St, Napier 4112

Keywords: conservation farming, regen ag, biological farming, regenerative agriculture, rural research

EDGAR A. BURNS
UNIVERSITY OF WAIKATO

Abstract: A significant shift in farming is underway in New Zealand. Regenerative agriculture has become a prominent topic of conversation among farmers, government officials, policy-makers, and researchers interested in supporting changes in environmental farm practices that overcome degrading soil and water. Farmers' interest in the "regen ag" movement's positive environmental message is of mainstream importance to the New Zealand economy. As business operators, all farmers are increasingly influenced by regulations about water quality, nutrient runoff, and soil erosion. Regen ag creates an innovative mindset in farm practice choices benefitting the long-term viability of New Zealand agriculture, the main income earner for the country. Further research is needed for farmers and businesses in and outside the rural sector to secure opportunities around regenerating agriculture that farms *with* the environment rather than exploiting the environment.

1. BACKGROUND

Agriculture as the major business sector earning overseas income for New Zealand continues to change. From the Rogernomics era, scrapping income supports and advisory input (Wallace, 2014), the expansion of dairying, shrinking of sheep numbers, closing of freezing works, formation of corporate dairy processor Fonterra in 2001, commodity prices stand in contrast to high-value exports like Manuka honey. In 2019, New Zealand's land-based primary industries generated $44 billion in export revenue (Williscroft, 2021).

The focus in this article is regenerative agriculture. Government and researchers are interested in supporting farmers' initiatives around the idea of regenerative farming beyond sustainability (Evans, 2020). Reprioritising the environment and land use also includes forestry, tourism and other areas (Matunga & Urlich, 2020). The *PureAdvantage* website (https://pureadvantage.org/) is supported by businesses, scientists and agricultural interests advocating for regenerative businesses of all kinds (Montgomery, 2012). Regen ag is a farmer-led innovative shift in farming purpose to protect and honour the environment. It influences other farmers and growers who have been less committed to the environmental dimension of farming. Various reports and case studies demonstrate (e.g. *AgMatters*, https://www.agmatters.nz/case-studies/) a renewed interest in rural entrepreneurship that builds on environmental frameworks that are becoming central in New Zealand's response to global warming impacts in its major industries.

The author of this article has had a small involvement in supporting the reach of regenerative agriculture in New Zealand, including contributing to the regen ag White Paper (2021) led by Gwen Grelet and Sam Lang. Grelet and Lang coordinated the input of over 200 scientists and experts in this project. Moving beyond twentieth-century reductionist approaches—farming is an ecological system as a whole, and farm landscapes are biological systems—can be seen in Masters' (2019) industry work and Grelet's research (Grelet, 2019, 2020; Grelet & Lang, 2020). Lang is a farmer and independent researcher, coordinating the Quorum Sense farmer network transitioning to regen ag (Lang, 2020, 2021; Grelet & Lang 2020; Siegfried, 2020b). I am a current member of the Ministry of Primary Industries (MPI) Technical Advisory Group (TAG) under the leadership of MPI Chief Scientist John Roche. In April 2021, a two-day New Zealand wide hui was held with a group of about 150 people, including consultants, policymakers, Māori who have an increasing voice and role in water management, plus farmers from different agricultural and horticultural sectors.

From a social science perspective, there are significant economic, political and rural implications in adopting environmental land-use practices for communities and demonstrating how attitudinal change across New Zealand society might better align with and support good farming environmental practice (Burns, 2020a, 2020b, 2020c, 2021). Even before the regen ag hui event, MPI had made a call for research proposals about regenerative farming practices (https://www.mpi.govt.nz/news/media-releases/mpi-calls-for-proposals-to-research-regenerative-farming-practices/) in 2020. The TAG's adopted principles maintain a broad definition of regen ag, being inclusive rather than prescriptive. This is a positive feature in the emergence of New Zealand regen ag. Differences to overseas regen ag farm practices, include local water politics, nutrient leaching, native biodiversity and the relative national economic importance of agriculture.

1.1. Regen ag in the news

In New Zealand, over one hundred media reports about regen ag, not counting social media, have appeared in New Zealand news and articles in the space of two years, 2019-2020. Some were individual stories of personal discovery of a new way to farm; some were science-oriented about sequestering carbon in the soil and regenerating soil health; others described the regen ag movement among farmers or wrote about farmer wellbeing. Farmers' desire to be on the front-foot about water quality, treating the environment well, and good animal practices, is increasingly evident. This news coverage about regen ag builds on many years of work by farmers going back decades and also by scientists researching soil-water-landscape intensification and what works in particular parts of the country.

This flurry of media interest connects with the new responses and farm practices that come from regen ag's different understanding of farming that respects and works with the farm environment. A small group has claimed there has been too much uncritical media attention (Campbell, 2021). Farming in ways consistent with protecting the environment has been around for as long as farming. In modern agriculture, however, opportunities for farming have been accompanied by a tendency to over-exploit soil fertility and water quality to grow a limited selection of plant and animal species. This has intensified in the late-twentieth century with more cleared land, greater demands on water and irrigation, and huge applications of fertilisers and chemical sprays.

Stevens, Casey and Cousins (2016, p. 67) reviewed 234 papers and articles about New Zealand agriculture. They noted a mid-1970s-80s peak of New Zealand research into agricultural "biophysical processes and productivity". The decades since there have seen an uneven growth in sociological and socio-economic studies that Stevens et al. categorise as "social, cultural, resilience, policy and regulation, and system behaviour and change". Further, farmer motivations and decision-making, policy influences, consumer attitudes, environmental values and market responses, now garner greater attention than previously.

It has been argued that conventional farming has been co-opted by the productivist model always aimed at producing more, but largely disregarding the cost to the environment. Not only has this degraded almost all of New Zealand's waterways: it has also degraded soil health (fungi, bacteria and other beneficial and necessary organisms) as the essential basis for producing food and fibre. The saying that on the whole, while we are not perfect, we are farming pretty well, is a New Zealand myth, at best a part-truth in terms of what we have done to the environment and on which our future depends.

Mueller (2021, p. 2) in discussing natural resource development, incidentally places agriculture in the "bad" column: "extractive development—oil, gas, timber, mining, agriculture". For agriculture to flourish for the benefit of New Zealand society and economy, steps to move agriculture to the "good" column are needed. Regen ag has the potential to be an important part of that plan. Regen ag combines existing scientific information with this new understanding of the environment's overarching biological and ecological needs. Contemporary research is needed about both the biophysical processes and the social and economic processes for a sustainable rebuilding of New Zealand's economic farming engine.

The New Zealand government's report *Our Land 2021* explores changes in land use and intensification in its second national cycle of environmental reporting. In documenting the current state of affairs, the social-human dimensions are intertwined with biophysical issues—both needing testing to measure the positive gains from regen ag, as well as assessing inadvertent or unexpected consequences in making present-day agricultural practice more regenerative:

> We require a better understanding of how land-use affects native land ecosystems, soil biodiversity, and wellbeing. Exploring the interactions between different environmental domains at different spatial and temporal scales will also improve our understanding of the land. (https://www.stats.govt.nz/information-releases/new-zealands-environmental-reporting-series-our-land-2021)

2. WHAT IS REGEN AG?

Reg ag is a contemporary approach to farming that emphasises ecological and environmental factors as integral rather than obstacles. New Zealand farming in the last two hundred years has applied a settler mentality where it was seen as desirable to clear land, plant grasslands or cropping, fill in wetlands, channel waterways, and in the second half of the twentieth century, increasingly apply fertilisers and chemicals to boost production and control pests above and below ground (Weaver, 2006).

This change from traditional lower-intensity farming had become conventional by the second half of the twentieth century. Many regenerative agriculturalists and other

environmentally conscious farmers would support a summary statement like the following (O'Connor, 2020, p.6):

> For too long, we've been fed the narrative and story that this industrial, agricultural system is the only way we can feed people efficiently. And if something in the system seems broken or is failing? Well, we just simply need to extract a little bit more out of the land and out of our farmers and ranchers and feed the system a few more inputs and chemicals. If we can increase yield and efficiency at all costs, the system will work. We've been sold the idea that the cheaper the food, the better. The faster it is made and gets to us, the better.

The most accessible and direct way to learn about regen ag is through books by farmer practitioners such as Gabe Brown (2018) in the United States, Peter Andrews (2014) or Charles Massy (2017) in Australia. Accounts by writers such as Siegfried (2020a) or Evans (2020) in New Zealand clearly describe the shift to regen ag. Even more accessible than reading the books are online YouTube videos of Brown, Massy, Andrews and others like Jones (2021) explaining face-to-face their approaches and actions in restoring degraded farming landscapes and the business implications. There are multiple international networks of conservation and environmental approaches to farming that offer a broad front for pivoting agriculture from an extractive approach in demand for ever-increasing outputs fed by fertiliser and chemical inputs. Regenerating fertility and environmental balance contrasts with having depleted biodiversity, landscape integrity and soil biological capacity in a few short decades. Without regen-ag as part of an environmental reorientation, we are heading towards the future of farming as an uneconomic enterprise.

2.1. Regen ag off-farm along the business chain

Many conversations and explanations of regen ag describe it as an on-farm rural phenomenon (Evans, 2020). There are, however, two regenerative agricultures—one on-farm and the other beyond the farm gate. On-farm, regenerative agriculture involves half a dozen principles and farm practices that reverse degrading of soil, biodiversity and fertility, nutrient leaching and soil erosion: low or no-till cultivation, maintaining biodiversity and ground cover, reducing or eliminating pesticides and fertiliser use, practices that improve soil health, farming as an ecological system. Guerra et al. (2021, p. 295) stress the foundational importance of soil biodiversity below ground: "Little is known about the conservation status of most soil organisms and the effects of nature conservation policies on soil systems. Yet like 'canaries in the coal mine,' when soil organisms begin to disappear, ecosystems will soon start to underperform, potentially hindering their vital functions for humankind". Until we are rebuilding the rich networks of soil organisms currently being destroyed at many times their replenishment rate, the business of farming and companies in the food and fibre supply chains are imperilled.

There is a second series of steps to complete the farm production-to-consumer cycle that occurs off-farm. These steps are also essential in reinforcing changing farm practices to practices that protect the environment and which also ensure farm viability as businesses both during the transition to regen ag and thereafter. These include marketing, branding and metrics about environmental performance such as Farm Environment Plans (e.g. https://www.dairynz.co.nz/environment/farm-environment-plans/).

Regen ag raises challenges for businesses externalising commercial logics. Farms, like any other business, strive to reduce and avoid costs, perhaps off-loading them to suppliers, intermediate participants in the supply chain, or onto the end consumer. Only in recent years have we begun documenting the externalising of costs to the environment in concepts like triple-bottom-line accounting, environmental and carbon emission auditing. Agriculture has a particular form of externalising costs: the cost to the environment over many farmed hectares in biogenic emissions, carbon/methane release and soil loss. The settler New Zealand economy was all about clearing land, draining wetlands, straightening rivers, putting up stop-banks and felling trees (McLauchlan, 2006). This was been considered good farming for two centuries, being viewed as the productive and morally worthwhile task of providing food and fibre for society at home and for earning export dollars overseas. A significant portion of the cost has been borne by an increasingly degraded environment and now climatic change.

3. WHAT DOES THE WHITE PAPER SAY?

The White Paper (Grelet, Lang et al., 2021) on regenerative agriculture was released in February 2021 and drew on many scientists and experts in many fields to bring together a research agenda to address the need for funding and research to support regen ag farming and its positive business consequences for agricultural sustainability and farmer wellbeing in New Zealand. The combination of soil science, water and ecological expertise, farmer and farm advisory skills, along with input on farmer wellbeing, socio-economic, financial and policy framing, combined multiple approaches towards maintaining momentum for this farming initiative.

The White Paper indicated many research possibilities, opportunities and needs for New Zealand's on-farm and off-farm rural businesses: *Regenerative agriculture in Aotearoa New Zealand–research pathways to build science-based evidence and national narratives.* Detailed chapters and excellent visual graphics summarised key points and necessary steps to fulfil the promise of regen ag. The White Paper set out seventeen priority research areas and elaborated nearly a dozen principles of regen farming in New Zealand. Gill's (2021) review summarised the White Paper and restated the scope and purpose:

> A new white paper was released earlier this week by New Zealand's *Our Land and Water National Science Challenge*, detailing the state of regenerative agriculture (RA) research in New Zealand, studying over 70 organisations and 200 participants across four agricultural sectors (dairy, sheep and beef, arable, and viticulture), with a specific focus on the overlap with indigenous Māori culture. 'The research underpinning this paper aimed to: (1) better understand what RA means for NZ and (2) develop a scientific framework for guiding RA research in NZ. It involved qualitative and quantitative online surveys, focus groups and literature/website searches, and focused primarily on what happens within the farmgate'.

One key business concept behind changing farm practices is that regen ag challenges conventional farming business logic by asserting that profitability, not the sheer quantity of output, is the aim. A narrow view of efficiency, meaning an ever-increasing quantity of output, has led to disregarding the natural underpinnings of any farm and has inevitably resulted in the degradation of water and soil. Business research and modelling are needed for both the transition processes farmers make shifting to regen ag, as well as the business and economic pathways that are implied in this transition (LaCanne & Lundgren, 2018).

There are implications and investigation needed for off-farm businesses too, and socio-economic testing and analysis to confirm the value of switching to regeneratively sourced agricultural products.

Manaaki Whenua LandCare Research (2020) explains the context of the White Paper project as follows:

> Farmers are under political and societal pressure to change their farming systems to reduce their agricultural, environmental impacts and improve ethical standards to meet increased consumer concerns about health, food safety, and animal welfare. Their problem is how to make changes to do this while sustaining production, profitability, and wellbeing.

The purpose of the White Paper was not to do the research on the biophysical, social, environmental or business implications of regen ag. The aim has been to respond to this farmer-led shift towards environmentally-oriented farm practice. Regen ag is pro-science and pro-business, farmers choosing to reposition themselves in family and wellbeing terms so that making a living this way is profitable, humanly worthwhile, and in alignment with preserving and regenerating the land and biodiversity in doing so. Bach et al. (2020, p. 1) explain the business case for regen ag:

> At the intersection of sustainability, conservationism and climate action, regenerative agriculture presents a solution that can help mitigate climate change, create more productive soil and support a more resilient food system. With core tenets emphasising building soil, minimising inputs and enhancing biodiversity, regenerative agriculture presents an opportunity for farmers to shift to a mindset of working with instead of against nature to support health and productivity of their farm. Regenerative agriculture encourages farmers to invest their time and resources into restoring their most valuable asset: their land.

In business terms, scientific information helps to do the right tasks in the right way and avoid the pitfalls of not having the relevant information. O'Connor (2020, p. 6) observed from interviewing US farmers about barriers to adoption, "We don't need to invent our way out of our current extractive agriculture system. The solutions are all around us. They are literally at our fingertips. In the soil. In the hearts of our farmers and ranchers… If we could only stop to notice them".

An additional business confirmation of the importance of regen ag can be seen in global equity funds, hardly naïve business operators. Their contemporary involvement in agriculture investments all around the world passes the venture capitalist test of risk for securing future returns. In New Zealand, regenerative practices fit well with Māori framing of *Te Taiao* (nature), in which the environmental health of land and water comes first. Healthy nature means healthy people: *Taiao Ora-Tangata Ora* affirms that when the natural environment thrives, so do communities and businesses.

4. BUSINESS — SECOND LEVEL REGEN AG

In the interest and enthusiasm to shift to more sustainable forms of farming, it is, however, insufficient to stop at descriptions of regenerative principles adopted by different farming sectors, necessary as that is. The second set of answers can be given—before and after research—to the question, "What is regen ag?" O'Connor's (2020, p. 128) interviews drew key inferences, first about needed science research and then about business research.

> The revolution in regenerative agriculture cannot occur without the reimagining of agricultural science. Science is necessary to validate regenerative systems, scale and transfer successful systems to other farms, remove barriers to innovative farmers wanting to change their operations, and develop the data to inform sound policies that can encourage farm resilience and adoption of practices.

Then turning to farm as business practice and evidence, O'Connor states:

> We must prioritise research that will lead to actual results in terms of changed practices and enabling regenerative agriculture to scale up as fast as possible. By demonstrating the potential of regenerative agriculture with field-based evidence, additional funding and investment can be attracted to the field for scaling up results and, perhaps most importantly, can guide the development and adoption of regenerative food and ag policy. This should include the quantification of the benefits for farmers of different management practices, with a focus on explaining and predicting how management practices translate to desired changes in soil carbon, water management, biodiversity, and nutrient cycling in various regions and systems.

There is also a research need to translate international work about regen ag to the New Zealand set in order to achieve environmental and business success.

This second-level of regen ag implementation outside the farm gate has seen several benchmark decisions taken recently that are likely to have significant influence in the orientation to regen farming. In one instance, General Mills (2020), a major United States food processing corporation, now actively promotes regen ag principles and recently announced it will commit to using product from one million acres of land by 2030, farmed according to regen ag principles. In another recent decision, the food corporation McCain's has said it is switching to source 100% of its potatoes worldwide from regen ag farms (Scott, 2021). Delivery on the promise, not simply intention, is, of course, the measure of real change. As regen ag grows in its public profile, there will inevitably be debates about branding and 'greenwashing' and renewed calls for how regen ag is measured.

4.1. A distinctively New Zealand regen ag

Research is underway about this new phenomenon, even while much more is needed. There is ample need for on-farm investigation and throughout the food chain for further research in marketing, technological innovation, consumer awareness and financial mechanisms enabling the shift to regen ag. Businesses may not see their particular interests in the science of farm environmental practices, but any New Zealand business is aware that in good years of production and earning, farmers collectively constitute a spending sector that boosts business activity in materials, assets and expansion across regional economies.

These New Zealand priorities are in flux at present as the regen ag movement expands in this country.

- In a geologically young landscape with steep gradients, water flows hold a different place than they do in some other countries.
- Māori voices expressing a holistic cultural approach to the environment and how land is treated, reflect an important perspective of stewardship and caretaking that has been significantly lost in conventional productivist farming.

- In water quality terms, the "clean and green" national New Zealand branding is a serious misnomer, but it can be renewed as an aspiration even for those not fully understanding the necessity to stop degrading our water and land.
- Branding, finance and marketing become essential tools to leverage the regen ag shift so that farming remains economically viable as it moves beyond conventional "more" production to farming within the limits of landscape, catchments and soil type.
- There are debates and research needed around regen ag labelling in New Zealand. The term "regenerative agriculture" has come from overseas (Brown, 2018; White, 2020). It gives farmers the freedom to innovate and try new things, conscious that improving their farming involves the environment as well.

Key developments and intentional initiatives in understanding regen ag and what it might mean for New Zealand's economy, the environment and business investment include:

(1) A plethora of reporting in the media over the last two years, some negative but for the most part positive about this new social movement among farmers (Siegfried, 2020b). This includes references to overseas regen ag examples and practitioners.

(2) Serious attention and research funding being offered by the New Zealand government so potential beneficial results can be developed economically, socially and culturally. The MPI Technical Advisory Group on regenerative agriculture is one example.

(3) Individual universities, research institutes and local groupings have responded to recent calls for expressions of interest in funding for research into the effects of regen ag.

(4) Particular sectors have taken the initiative in pursuing implications of regen ag—for example, Beef+Lamb research project in 2020.

(5) Many farm consultants have come on board with regen ag strategies to open pathways that can help their clients' environmental practices and benefit farm practice in other ways.

(6) Distinctive farmer-led groupings such as Quorum Sense provide networks of communication and support for farmers considering regen ag and environmental re-working of conventional farm practices.

(7) The White Paper on regenerative agriculture released 22 February 2021 provides a springboard for research on many fronts.

Regen ag holds as as the core tenet that we cannot simply continue "using up" the environment as though it costs nothing in conventional agriculture and horticultural business models. All businesses, in fact, all of modern society, have presumed on nature. We have assumed that clean water, farmland and sea to flush the system were "just there". In elementary business textbooks, you do not find nature as a factor of production. "Land" does appear as a factor of production, but we have long shifted from the traditional ideas that wool, meat and grains were derived from land and hence husbandry needed to support nature. Today, farming is exposed to land practices that make land use environmentally unsustainable. The regen ag focus is on carbon in soils and biodiversity, while urban businesses often focus on energy use, plastics and waste. Given that the bulk of any country is farmland (40 per cent of earth's land surface is farmland or cropland of some kind), this scale of human activity has consequences for catchments, regions, and nations as a whole if they continue to exploit nature in current ways.

In New Zealand, the phrase "dirty dairying" has become a byword for this collective negative effect of agriculture. Debates and contested positions abound, but Siegfried (2020a) and others speak of farmers being tired of being the "bad guys", feeling beleaguered. Some farmers recognise there must be, and in fact, can be, a better way forward, hence the advent of regen ag and other environmental commitments. In this shift, Māori *kaitiaki* values caring for the land are akin to the sense of stewardship many farmers share. Not all farmers do, but regen ag is significant in spearheading this shift from extractive demands for ever-increasing production. That is, efficiency fails if narrowly defined without referencing nature and water into the real cost of producing or processing an apple, a lamb, or a kilo of butterfat or wool.

4.2. Aligning business activity

Recognising the business importance of agriculture in New Zealand is a 'no-brainer". Three points can be made in considering how regen ag incorporates both environmental farm practice and business practice. First, it is important to recognise that a substantial amount of research, extension, and marketing work is going on in overseas markets about regenerative agriculture. Second, sociologically speaking, farmers' interest in regen ag and willingness to travel far to attend events, read and watch accounts of other farmers who have switched to regen ag, and spend time and effort in support networks about innovating their farming practice, can be called a social movement. It is outside the carrots-and-sticks paradigm regional governments struggle with to incentivise the necessary change to farming's environmental practices. The desire to communicate with other farm practitioners has a positive "viral" quality and network benefits. Third, in significant ways, regen ag is a non-business proposition. Although farming has fundamentally important business and marketing implications that are beneficial in the long term, the motivating drivers of the actions and practice changes are personal and environmentally focused farm enterprises.

Melhem (2021) provocatively reminds us that:

> In New Zealand's Southern Alps, braided rivers radiate turquoise from the glacial flows coming off snow-capped mountains. Breathtaking vistas like these have provided the backdrop for Hollywood epics like *Lord of the Rings* and underpin one of the world's most recognised tourism campaigns, '100% Pure New Zealand'.
>
> But behind New Zealand's clean and green image is a dirty truth—its freshwater rivers are among the most polluted in the developed world. Last year, a government report found nearly 60 percent of the country's rivers carry pollution above acceptable levels, with 95 to 99 percent of rivers in pastoral, urban, and non-native forested areas contaminated.

A willingness to shift from volume to environmental value as a national and business strategy needs to be part of New Zealand's move to regen ag and which in turn will be supported by regen ag.

At the other end of the supply chain, consumers' understanding and priorities cannot be ignored either (Bach et al., 2020, p. 2):

> Consumers, too, are paying attention to the practices that go into their purchases. Two out of every three consumers in the United States, UK, and China said that companies should invest in sustainability, including accountability in the supply

chain. While regenerative remains a relatively new term in the marketplace, a 2019 survey showed that 55% of overall consumers are interested in learning more, and that young people—tomorrow's buying force—were two to three times as likely as older generations to be aware of regenerative.

Finding ways to capture that mix of consumer and national supplier value needs hard thinking and testing, but it offers the potential for twin gains. The first comes from doing the right thing in terms of the environmental imperatives driving climate change and threatening society as currently practiced. Second, regen ag opens multiple commercial opportunities to take advantage of New Zealand's location and current positioning in global agriculture. O'Connor (2020) identifies a list of barriers to adopting regen ag. She argues that each barrier, however, offers levers for change and emerging opportunities that can be pursued:

- Behaviour and cultural change
- Land access
- Trusted technical assistance
- Financial capital and incentives
- Regenerative supply chains
- Strategic communications
- Research and science
- Policy reform

Application of research and investigation into regen ag could be thought of as the domain of science, Plenty of science will benefit the pivot to work with the environmental drivers of farm production. But as O'Connor describes in setting out this list, at least half of these barriers-opportunities, depending on how each is defined, can be said to be directly the business of business, even if it is not directly doing agriculture.

5. CONCLUSION: REGEN AG RESEARCH AND THE BUSINESS OF FARMING

Coming back to the business context perspective in considering farming as a business enterprise does not mean attention primarily on its corporate or organisational participants such as Fonterra or Beef+Lamb. The cumulative total of individual farm business units predominate in New Zealand agriculture and are vitally important to the economy. The country's farmers share many features of small and medium-sized businesses. In addition to these features, farmers' enormous asset base and commitment to land involves self-identity, hard physical work, business risk, employee relations, and a normative positioning in society that does not apply so obviously to other businesses.

Changes over several decades have left many farmers distraught at the sense of being turned against as the "bad guys". Central questions in business terms—profit, robust market sales, etc. are not the only central questions in farming terms because these are instrumental versus stewardship values. Nevertheless, even allowing that a mixture of commercial and intrinsic values guides farmer actions, there are many reasons why farmers might adopt

or consider adopting regen ag. Within this decision-making process, the economic issue of regenerative and economic viability is indeed central to farmers' and New Zealand's interest and willingness to move toward environmental practices integral to farming the land.

Any new innovation is unlikely to be perfect out of the gate. Regen ag needs validation, new insights, adjustment of missteps, market appreciation, new information and scientific research. The White Paper effort to chart key contours and options in developing research that supports regen ag represents a broad focus above and below ground that supports New Zealand's key farming sectors. As part of growing ecological awareness and stronger direction from New Zealand's government, farmer-led agriculture and horticulture are well positioned to act in quick timeframes to significantly restore soils, improve water and sequester carbon. The expansion of research-based information will assist accurate decision-making that smart businesses on-farm or off-farm have opportunities to investigate and develop.

REFERENCES

Andrews, P. (2014). *Beyond the brink: Peter Andrews' radical vision for a sustainable Australian landscape.* Sydney, NSW: HarperCollins.

Bach, D., Sayers, N., & Weatherford, H. (2020). The business case for regenerative agriculture. https://es.nsf.org/newsroom_pdf/sus_regenerative_white_paper.pdf.

Brown G. 2018. *Dirt to soil: One family's journey into regenerative agriculture.* Hartford, VT: Chelsea Green.

Burns, E. A. (2020a). Placing regenerative farming on environmental educators' horizons. *Australian Journal of Environmental Education*, 1-11. https://doi.org/10.1017/aee.2020.21

Burns, E. A. (2020b). Thinking sociologically about regenerative agriculture. *New Zealand Sociology*, 35(2), 189-213.

Burns, E. A. (2021). Regenerative agriculture—farmer motivation, environment and climate improvement. *Policy Quarterly, 17*(3), 54-60.

Campbell, A. (2021, 17 February). Regenerative farming fight sad. *Rural Life.* https://www.odt.co.nz/rural-life/rural-life-other/regenerative-farming-fight-sad.

Evans, K. (2020). Regenerative agriculture. *New Zealand Geographic*, (164), 36-59.

General Mills. (2020). Regenerative Agriculture. https://www.generalmills.com/en/Responsibility/Sustainability/Regenerative-agriculture.

Gill, B. (2021, 26 February) New white paper on regenerative agriculture research in New Zealand. Savory. https://savory.global/new-whitepaper-on-regenerative-agriculture-research-in-new-zealand/.

Grelet, G. (2019). Global game changers in agriculture. Quorum Exchange seminar, Leeston, Canterbury. (Video 46.14 mins). www.youtube.com/watch?v=kxNBhOSPbAc.

Grelet, G. (2020). The science of regenerative agriculture with Dr Gwen Grelet (with Alina Siegfried). *Pure Advantage*, New Zealand. https://pureadvantage.org/news/category/our-regenerative-future/page/3/.

Grelet, G. Lang, S. (2020). Regenerative agriculture in New Zealand. (Video 28.47 mins). www.youtube.com/watch?v=fE1hMrAWyxQ&mc_cid-18097e55a38mc_eid-aOb57b9054.

Grelet, G., Lang, S., et al. (2021 February). *Regenerative agriculture—The New Zealand example: Pathways to building the scientific evidence and progressing national narratives.* White Paper. Our Land and Water National Science Challenge, Next, Manaaki Whenua Landcare Research. New Zealand.

Guerra, C. A., Bardgett, R. D., Caon, L., Crowther, T. W., Delgado-Baquerizo, M., Montanarella, L., Eisenhauer, N. (2021). Tracking, targeting, and conserving soil biodiversity. *Science, 371*(6526), 239-241. https://doi.org/10.1126/science.abd7926

Jones, C. (2021). Secrets of the soil sociobiome. YouTube. https://www.youtube.com/watch?v=Xtd2vrXadJ4.

LaCanne, C. E., & Lundgren, J. G. (2018). Regenerative agriculture: Merging farming and natural resource conservation profitably. *PeerJ, 6*, 1-12. https://doi.org/10.7717/peerj.4428

Lang, J. (2021, 28 January). Gear change: Getting a grip on the fact(s). *Pure Advantage*, New Zealand. https://pureadvantage.org/news/2021/01/28/gear-change-getting-a-grip-on-the-facts/.

Lang, S. (2020). Social cohesion in rural communities with Sam Lang (with Alina Siegfried). *PureAdvantage*, New Zealand. https://pureadvantage.org/news/category/our-regenerative-future/page/3/.

Massy C. (2017). *Call of the reed warbler: A new agriculture—a new earth.* Brisbane, Qld: University of Queensland Press.

Masters, N. (2019). *For the Love of Soil.* New Zealand: Printable Reality.

Manaaki Whenua LandCare Research. (2020). Regenerative agriculture in New Zealand. https://www.landcareresearch.co.nz/discover-our-research/land/soil-and-ecosystem-health/regenerative-agriculture-in-new-zealand/.

Matunga, H., Matunga, H., & Urlich, S. (2020). From exploitative to regenerative tourism: Tino rangatiratanga and tourism in Aotearoa New Zealand. *MAI Journal: A New Zealand Journal of Indigenous Scholarship, 9*(3), 295-308. https://doi.org/10.20507/maijournal.2020.9.3.10

McLauchlan, G. (2006). *The farming of New Zealand: The people and the land.* Auckland: Penguin.

Melhem, Y. B. (2021, 17 March). New Zealand's troubled waters: New Zealand's waterways are some of the most degraded in the developed world. Will the Ardern government clean it up or will Māori take control? *ABC News.* https://www.abc.net.au/news/2021-03-16/new-zealand-rivers-pollution-100-per-cent-pure/13236174.

Ministry for the Environment and Statistics New Zealand. (2021, April). *Our Land 2021*. https://environment.govt.nz/assets/Publications/our-land-2021.pdf.

Montgomery, D. (2012). *Dirt: The erosion of civilisations.* Berkeley, CA: UCLA Press.

Mueller, J. T. (2021). The dual dependency of natural-resource-rich labor markets in contemporary society. *Sociological Theory.* https://doi.org/10.1177/07352751211001920

O'Connor, J. (2020, August). Barriers for farmers and ranchers to adopt regenerative Ag practices in the US: Identifying key levers and opportunities—A roadmap for funders and stakeholders. San Francisco, CA: Guidelight Strategies. https://forainitiative.org/wp-content/uploads/Barriers-to-Adopt-Regnerative-Agriculture-Interactive.pdf.

Scott, A. (2021, 18 June). McCain embraces regen ag. *Farmers Weekly.* https://farmersweekly.co.nz/section/horticulture/potatoes/mccain-embraces-regen-ag

Siegfried, A. (2020a, 4 May). What is regen ag and why is it big for NZ? *Newzsroom.* https://www.newsroom.co.nz/2020/05/04/1155648/alina-siegfried-good-bad-opportunity.

Siegfried, A. (2020b). Social cohesion in rural communication with Sam Lang. *PureAdvantage.* https://pureadvantage.org/social-cohesion-in-rural-communities-with-sam-lang/.

Stevens, D. R., Casey, M. J., & Cousins, K. A. (2016). Farming systems research: Purpose, history and impact in New Zealand hill country. NZGA: *Research and Practice Series, 16*, 67-85. doi:10.33584/rps.16.2016.3261

The Royal Society. (2020, April). Soil structure and its benefits: An evidence synthesis. https://royalsociety.org/-/media/policy/projects/soil-structures/soil-structure-evidence-synthesis-report.pdf.

Wallace, N. (2014). *When the farm gates opened: The impact of Rogernomics on rural New Zealand.* Dunedin, New Zealand: Otago University Press.

Weaver, J. C. (2006). *The great land rush and the making of the modern world 1650-1900.* Montreal, QC: McGill-Queen's University Press.

White, C. (2020). Why regenerative agriculture? *American Journal of Economics & Sociology, 79*(3), 799-812. https://doi.org/10.1111/ajes.12334

Williscroft, C. (2021, 15 April). Call to protect productive land. *Farmers Weekly.* https://farmersweekly.co.nz/#